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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

GENERAL SPECIFICATION

OPERATIONS LOCATION CODING SYSTEM FOR CREW INTERFACES

MANNED SPACECRAFT CENTER

HOUSTON, TEXAS

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THIS SPECIFICATION HAS BEEN
APPROVED BY THE MANNED SPACECRAFT
CENTER (MSC) AND IS AVAILABLE
FOR USE BY MSC AND
ASSOCIATED CONTRACTORS

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FOREWORD

Operational experience in previous spacecraft programs (Mercury, Gemini, Apollo and Skylab) has emphasized the need for establishing a specification for assignment of location codes to the crew interfaces of the spacecraft. Particularly, Skylab Program experience has shown that present systems for identifying stowage locations and control-display panels are: (1) not adequate to handle the magnitude of items required to be located, (2) have little location significance, and (3) require program personnel to learn multiple systems for designating and locating crew interface items.

The trend toward larger and more complex spacecraft with much larger free volume for crew operations and with increased numbers of controls and displays and larger inventories of loose equipment further emphasizes the need for a standard and large capacity coding system for locating and designating crew interface items. The Operations Location Coding System for crew interfaces specified herein has been established to meet these needs.

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1.0 INTRODUCTION

1.1 PURPOSE. The purpose of this specification is to establish a standard method of location coding of crew interface items in manned spacecraft and has general applications for:

a. Crew station design and operation review activities

b. Panel and trainer/flight article labeling

c. Designations of control/display panel locations on systems schematic data, operations handbooks, and other training data

d. Stowage list location data

e. Flight crew operations and in-flight maintenance procedures data

f. Manufacturing and ground preparations

g. Test and checkout procedures data

h. Designating EVA work site locations

1.2 SCOPE. The Operations Location Coding System for crew interfaces has application to all manned spacecraft including launch type vehicles, lunar lander type vehicles, earth orbital shuttle vehicles and payloads, space station type vehicles (zero and artificial G), and space tug type vehicles, and shall provide specific location coding information on the following crew interface items:

a. Control and display panels

b. Stowage areas, lockers, subcompartments and containers

c. Access panels

d. Systems components and equipment

e. Stowage of experiments and loose equipment

1.3 APPLICABLE DOCUMENTS. The following documents, of the issue in effect on the date of invitations for bids or procurement, form a part of this specification to the extent specified herein.

1.3.1 NASA Specifications.

SC-D-0001	Metal Foil Decals
SC-M-0003	Markings, Labeling, and Color Manned Spacecraft and Related Flight Crew Equipment Functional Design Requirements for

1.3.2 Military Standard.

MIL-STD-1472 Human Engineering Design Criteria for Military Systems, Equipment and Facilities

1.4 DEFINITIONS. For the purpose of this specification, the following definitions shall apply:

a. Room - Designated free volume space (partitioned or arbitrarily separated from other volumes) in or around spacecraft, occupied by a crewman.

b. Bulkhead - One of the enclosures of a spacecraft room. It may be a vertical surface between a deck and overhead, or may be a curved portion of a cylinder, or the entire portion of a cylindrical room.

c. Overhead - That surface of the room that is above (as determined by the nominal crew operating position) and is the room surface that attaches to the upper bulkhead boundary. In some quonset and cylindrical rooms, the bulkhead surfaces are continuous and no overhead exists.

d. Deck - That surface of the room that is footward (as determined by the nominal crew operating position) and is the room surface that attaches to the lower bulkhead boundary. In some quonset and cylindrical rooms, the bulkhead surfaces are continuous and no deck exists.

e. Overhead Reference Plane - An arbitrarily designated reference plane which is tangent to or parallel with upper bulkhead boundary and used as a reference for height coding.

f. Bulkhead Locations - Items, areas, or volumes that are within, attached to, or directly adjacent to the "defined" bulkhead of the room, and which are routinely accessible from within the room, either directly or through bulkhead openings, and have design provisions for repeated access.

g. In Front of Bulkhead Locations - Items, areas, or volumes that are directly in front of and attached to or adjacent to designated bulkhead locations or other in-front of bulkhead locations.

h. Hidden Locations - Items, areas or volumes located behind bulkhead maintenance access covers or openings which are not designed for routine access.

i. Control Station - A partitioned room or a designated area within a room, usually in "cockpit or console" configuration style, in which crew activities involve operations and monitoring of spacecraft or experiments controls/displays.

2.0 RESPONSIBILITIES

2.1 NASA/MSC

a. Shall monitor contractor utilization of this specification and determine compliance with same.

b. Shall apply the specification to contractor and government furnished equipment.

c. Shall approve deviations to the specification.

d. Shall update, revise, or otherwise modify the specification as required.

2.2 CONTRACTOR

a. Shall be responsible for compliance with this specification.

b. Shall request specification deviations from NASA/MSC.

c. Shall recommend revisions to the specifications, as deemed appropriate.

3.0 DESCRIPTION OF OPERATIONS LOCATION CODING SYSTEM FOR CREW INTERFACES

3.1 GENERAL DESCRIPTION. The Operations Location Coding System for crew interfaces provides a unique alpha-numeric designator for coding; a) modules, b) areas within modules, e.g., rooms, and control stations, c) locations of items within those areas. Specific designators or codes to be assigned to each of the above categories are illustrated in a top level overview of the Operations Location Coding System in Figure 1. As implied by Figure 1, the system consists of two basic coding conventions, one applicable to "control station" type areas and the other applicable to all other spacecraft areas or "rooms". Description of these two coding conventions and guidelines to their applications are presented in the following paragraphs of this specification. The technical description is divided into three major sections. The first two sections describe separately the two coding conventions. The third section establishes guidelines for applying each of the two coding conventions to extra-vehicular worksites. The subsections, within each section, describe the technique of coding the module, areas within the module, and the locations within the areas in this specific order.

Operations location coding of spacecraft shall be accomplished within the framework of guidelines presented in the following paragraphs.

3.2 ROOM CODING CONVENTION. The Room Coding Convention, as illustrated by Figure 2, consists of two distinct systems, one applicable to location coding of room bulkheads and the other applicable to location coding of room overhead and deck. A description of each coding system and their application guidelines is presented in the following paragraphs.

3.2.1 Room Bulkhead Coding. The room bulkhead code shall consist of two functional groups of designators -- a module/room designator and a room bulkhead location designator. As noted in Figure 2, a third functional group of designators, subcompartment discrete codes, shall be used when location designators within lockers, drawers or compartments are required. Instructions contained in 3.2.1.1 through 3.2.1.3 define the content of the Room Bulkhead Coding System and room configuration formats when applying the system.

3.2.1.1 Module/Room Coding. The first group of three (3) characters (XXX-00000) for the Room Coding Convention, Figure 2, shall designate the module and room within the module. The first character, the module code, shall be either a number or letter designator (except "I" which is not used and the letter "V" which is reserved for extra-vehicular work-site designation). The number code (0 thru 9) shall be used to sequentially designate shuttle or mass transfer type spacecraft. Letters, sequentially assigned and starting with "A" shall be used to designate all other spacecraft modules. The second character (0X0-00000) of the module/room code is a basic room designator. The room designators (letters) which shall be used when applying the Room Coding Convention are presented in Table I. A module code and a single character room code will normally be sufficient to describe the function within the room and to identify uniquely each room within multimodular spacecraft. Some of the basic Room Designators, second character, presented in Table I are generic designators of rooms whose names encompass a class of functions, e.g., Lab, Experiment, System. Modules in which two or more functions (within a class) are performed in separate rooms shall have a two character room code. The second room character shall also be a letter designator. The code descriptors (00X-00000) which shall be used to describe room functions, when required, are presented in the last column in Table I.

3.2.1.2 Room Bulkhead Scale Coding. As illustrated in Figure 2, a second group of characters (000-XXXXX) after the first dash and following the module/room code is used for location coding of a bulkhead and of an overhead/deck.

The first three characters (000-XXX00) of the bulkhead code shall designate peripheral distance around the bulkhead from the left frame of the main entrance to the room or a designated bulkhead coding starting point if no obvious entrance exists. These characters of the bulkhead code shall be numbered sequentially from 00 to 999 with each unit of the bulkhead code scaled to ten centimeters (or four inches) of bulkhead distance. (English units presented in parenthesis following metric units, throughout this specification, are not intended to show unit equivalents but to specify the scale or dimension requirement for both the English and metric systems.) When the

Table I

Module/Room Designators

CODING CONVENTION	FIRST CHARACTER: MODULE DESIGNATOR	SECOND CHARACTER: BASIC ROOM/CONTROL STATION DESIGNATOR	THIRD CHARACTER: ROOM FUNCTIONAL DESCRIPTOR
ROOM CONVENTION	NUMBERS (0 - 9) FOR SHUTTLE TYPE MODULES. LETTERS (A -Z, EXCLUDING I)* FOR ALL OTHER MODULES.	A = AIRLOCK	N = NADIR C = CELESTIAL OTHER LETTERS AVAILABLE FOR ASSIGNMENT
		B UNASSIGNED *	UNASSIGNED *
		C = CONTROL CENTER	A-Z *CODE LETTERS UNASSIGNED *
		D = UNASSIGNED *	UNASSIGNED *
		E = EXPERIMENTS AND L = LABS	USED WITH BASIC CODES "E" AND "L": A = ANIMAL/AGRICULTURE B = BIOLOGY/AGRICULTURE E = ELECTRICAL/ELECTRONIC F = FILM PROCESSING/PHOTOGRAPHY H = HEALTH/MEDICAL M = MECHANICAL O = OPTICS P = PHYSICS Z = AIRLOCK OTHER LETTERS UNASSIGNED*
		F = FACILITIES, STOWAGE MAINT., MISCELLANEOUS	A-Z = UNASSIGNED * F = FOOD STOWAGE L = LAUNDRY
		G = GENERAL USAGE	A-Z = UNASSIGNED * B = BRIEFING/CONFERENCE C = CHAPEL L = LIBRARY S = STUDY D = DINING R = RECREATION T = THEATER
		H = HYGIENE, PERSONAL	A-Z = UNASSIGNED *
		J = UNASSIGNED *	UNASSIGNED *
		K = KITCHEN	A-Z = UNASSIGNED *
		M = MEDICAL & CREW CARE	A-Z = UNASSIGNED * H = HOSPITAL D = DISPENSARY
		N = UNASSIGNED *	UNASSIGNED *
		Ø = UNASSIGNED *	UNASSIGNED *
		P = PAYLOAD	A-Z CODING FOR SPECIFIC "PAYLOAD" AREA DESIGN *
		Q = QUARTERS, CREW	A-Z CODING FOR SPECIFIC "QUARTERS" DESIGNATION *
		R = UNASSIGNED *	A-Z CODING FOR SPECIFIC "ROOM" *
		S = SYSTEMS	USED WITH BASIC CODE "S": A = ACTIVE THERMAL CONTROL C = CRYOGENIC SYSTEM D = DATA PROCESSING E = ELECTRICAL POWER G = GUIDANCE & CONTROL L = LIFE SUPPORT/ENVIRONMENTAL CONTROL M = MAINTENANCE P = PROPULSION R = REACTION CONTROL T = TELECOMMUNICATIONS OTHER LETTERS UNASSIGNED*
		T = TUNNELS/PASSAGEWAYS	A-Z = UNASSIGNED *
		U = UNASSIGNED * V = NOT USED *	A-Z = UNASSIGNED * A-Z = UNASSIGNED *
		W = WARDROOM	A-Z = UNASSIGNED *
		X = EXERCISE/GYM Y = UNASSIGNED * Z = UNASSIGNED *	A-Z = UNASSIGNED * A-Z = UNASSIGNED *
CONTROL STATION CONVENTION	SAME AS ABOVE	NUMBER 0-9	NUMBER (USED WITH 2ND CHARACTER TO DESIGNATE NUMBERS OF CONTROL STATIONS)
EXTRA-VEHICULAR WORK-SITES DESIGNATION	SAME AS ABOVE	V	LETTER A→Z EXCLUDING I WHEN USING ROOM CODING CONVENTION OR NUMBER 0-9 WHEN USING CONTROL STATION CODING CONVENTION

*V = EXTRAVEHICULAR LOCATION

bulkhead perimeter is less than ten meters (or 33.3 feet), only two characters need to be used -- 00 to 99. The third character is used to code room bulkhead locations greater than 99 to accommodate a maximum perimeter of 100 meters (or 333.3 feet). Peripheral locations from ten to 100 meters (or 33.3 to 333.3 feet) will be coded 100 to 999 respectively. Figure 3 illustrates the application of room bulkhead coding to a typical space station room and specifies guidelines for general application of this coding convention.

The fourth character (000-000X0) or third if a two digit bulkhead scale code is applicable, as indicated by Figure 3, is a letter designator (A through Z excluding "I") and shall be measured from the overhead to the designated deck. Height measurement in rooms not having an apparent (or structurally defined) overhead shall be from an arbitrarily designated reference plane to provide height location resolution. Figure 4 illustrates typical height location coding and includes room configurations which require designation of arbitrary overhead reference planes. Example 1 of Figure 4 is a room in which there is an apparent overhead and therefore does not require designation of an arbitrary overhead reference plane. The room overhead may be used as a reference for height coding. A quonset type room typical of a partitioned cylindrical module, Example 2 of Figure 4, is an example of a room configuration which requires an arbitrary overhead reference plane. The overhead reference plane of Room A is established at a point tangent to the pressure bulkhead and parallel to the deck.

The height as measured from the overhead reference plane would be applicable to locating and coding of items on the bulkhead planes that are perpendicular to the deck plane and to items located on the deck, if required. (Guidelines to establish height codes for items located on the deck are specified in 3.2.2.2).

The curved bulkhead of quonset rooms requires a special coding method. This method requires that the curved bulkhead be folded out from the line of tangency of the overhead reference plane to the pressure bulkhead and projected onto an equal area plane as illustrated in Example 2 of Figure 4. Bulkhead projections shall be required on both sides of those quonset rooms that extend the full deck diameter of the module. The bulkhead height coding on these surfaces shall be the same unit size (ten cm.) as on the end bulkheads but shall be measured from the projected bulkhead overhead reference line. This is the curvilinear distance of the room bulkhead and will not coincide with the height coding of the end bulkhead.

Example 3 of Figure 4 illustrates other variations of the quonset room height coding. This is further illustrated in three dimensions in Figure 5 for all the basic quonset room types. Specific examples of item height coding in room bulkhead coding and overhead/deck coding systems are included in Figure 6. The overhead/deck coding system is discussed in 3.2.2.

The height axis for all rooms shall be scaled to a unit dimension of ten centimeters (or four inches). Use of a similar scale for both the height and the peripheral distance thus permits a location resolution to a ten centimeter (or four inch) square for bulkheads in conjunction with the bulkhead scale code. The ten centimeter height scale will handle a maximum vertical distance of 2.5 meters. Bulkheads having a height greater than 2.5 meters shall be scaled with the minimum possible integer unit size (in increments of five centimeters or one inch) to provide maximum location resolution.

The fifth character (000-0000X) of the room bulkhead code (or fourth if peripheral distance is less than 10 meters or 33.3 feet) is a discrete code used to locate such items as access panels, lockers, loose equipment, etc. that are adjacent to but remote from the bulkhead (in front of or behind the bulkhead). This character is normally not required. Coding of typical items requiring this discrete code are included among those items illustrated in Figure 7 and 8. Guidelines that determine when this discrete code shall be used are as follows:

a. Items located adjacent to and in front of another item on the bulkhead shall have a fifth (or fourth) character discrete code. This code for the item on the bulkhead shall be the letter "A" (first level, 000-0000A). Item(s) in front of and adjacent to "A" shall be designated "B" (second level from bulkhead, 000-0000B), "C" (third level from bulkhead, 000-0000C), etc. Examples [M], [N], [Ø], [P], [Q] of Figure 7 and Examples [2], [3], [4] and [5] of Figure 8 are illustrative of lockers coded with a third dimension discrete, the fourth character following the dash.

b. Lockers located in front of two or more lockers whose level from the bulkhead is different shall be coded with the next highest sequential letter. This is illustrated in Figure 7 with Examples [M] and [Q] on the first level (A), in front of the bulkhead, [R] on the second level (B) and lockers [N] and [P] on the third (C) and fourth (D) levels, respectively.

c. Hidden items located behind bulkhead access panels shall use a fifth character discrete (000-0000X), fourth if room perimeter is less than ten meters, for location designation. A number discrete shall be used for hidden components to discriminate from letter designated in-front of the bulkhead location codes. Examples [J], [K] and [L] of Figure 7 and [7] and [8] of Figure 8 are illustrative of coded items located behind bulkhead access panels.

3.2.1.3 Room/Bulkhead Subcompartment Coding. The third group of two characters, (000-00000-XX) separated from the bulkhead scale code by a dash, is a subcompartment discrete code. These characters will not normally be required and shall be used only when items within a locker or compartment location are to be designated. Examples of subcompartment coding are illustrated in Example [1] of Figure 8. Both letter discretes (A through Z excluding "I") and number discretes (0 through 9) shall be used, if required, to avoid a two character subcompartment code. Example [1] illustrates usage of one character letter and number codes as well as two character codes.

3.2.2 Room Deck/Overhead Scale Coding. In addition to the bulkhead perimeter coding, room deck/overhead coding will normally be required for location coding of a spacecraft room. Guidelines for application of deck/overhead coding are presented in 3.2.2.1 through 3.2.2.3.

3.2.2.1 Module/Room Coding. As indicated by Figure 2, the module/room code for a room deck/overhead is identical to that for room bulkhead perimeter coding. Guidelines for coding modules and rooms when applying deck/overhead coding shall be in accordance with 3.2.1.1.

3.2.2.2 Deck and Overhead Grid Coding. The second group of five characters (000-XXXXX) of the deck/overhead grid code shall be used to locate items that are remote from the bulkhead and bulkhead locations. The first character (000-X0000) is an area designator which defines the grid area containing items or equipment requiring a location code. This character shall be one of the following four letter descriptors:

a. D - Area designator for items located on the Deck.

b. O - Area designator for items located Overhead.

c. A - Area designator for items located Above the overhead.

d. B - Area designator for items located Below the deck.

Coding examples and illustrations of the usage of this grid area code will be covered in the subsequent paragraphs which specify guidelines for complete deck/overhead location coding.

The second and third characters (000-0XX00) of the deck/overhead scale code designate subdivisions of a plane (overhead or deck plan) described by a two-dimensional coordinate system. The two axes of the coordinate system, as illustrated in Figure 9, shall be designated with letters (A through Z excluding "I" and number 0 through 9) in a left-to-right direction and a forward-to-aft direction. The second character shall be the forward-to-aft letter designator and the third character shall be the left-to-right letter designator. Guidelines for application of deck/overhead coding to space vehicles are specified in Figure 9.

The fourth character (000-000X0) of the deck/overhead code is a room height scale and shall be a letter designator that measures height from the overhead reference plane to the midpoint of an item. As noted in Figure 2, the height code, applicable to deck/overhead coding, is normally not required. Such items as a multi-drawer film vault or cabinet containing several drawers, remotely located from the bulkhead, will however, require a height code to uniquely code and locate each drawer. If the height of each drawer is less than ten centimeters (or four inches), then the height code shall be the midpoint of the total film vault or cabinet. A fifth character, a high resolution designator, 0 through 9, shall then be used to discretely identify

the film drawers. As noted in Figure 2, the high resolution characters shall also be used to discriminate between two or more small items, all of which have the same height code and whose midpoints fall within the same 40 centimeter (or 15 inch) square of the grid area. Such items shall be discretely coded with a letter (A through Z, excluding "I"). The use of the high resolution coding character will rarely be required and shall never be used without a room height letter designator, the fourth character. Coding examples of items located on an overhead and deck are presented in Figure 10.

3.2.2.3 Deck and Overhead Subcompartment Coding. Subcompartment coding of items located on the deck or overhead shall be in accordance with 3.2.1.3.

3.3 CONTROL STATION CODING CONVENTION. The Control Station Coding Convention is consistent with the Room Coding Convention as three distinct groups of coding characters are used in each convention. Instructions in the application of the Control Station Coding Convention and its description are presented in 3.3.1 through 3.3.3.

3.3.1 Module Code/Control Station Designation. The first functional group of characters (XXX-0000) is a module and control station designation. The module shall be coded as specified in 3.2.1.1. The control station designators (0XX-0000) are one or two digit codes which shall be discrete sequential numbers. As noted in Figure 2, the third character (00X-0000) of the module/control station code will not normally be required since a single digit permits the designation of ten control station sites (0 through 9) within each module.

3.3.2 Control Station Panel or Subdivision Coding. The second group of characters (000-XXXX) shall designate the panel or area and subdivisions within the control station. The first character, (000-X000) the area designator, shall be in accordance with the letter codes specified in Figure 11 which illustrates the directional significance of the codes and the relative location of the coded areas in a typical cockpit type control station. Division of a control station into directional areas for location coding may not, in some cases, be apparent. For example, the Forward/Right Hand Access Area (F/R) and the Forward/Left Hand Access Area (F/L) of Figure 11 may, optionally, be coded either F or R and F or L. A determining factor for coding such panels shall be function(s) performed on the panels. If the functions performed on the "F/R Panel" and the "F/L Panel" are operationally more related to the control/display functions of the other Forward Panel arrangements, then the letter designator shall be "F". However, if these panels are functionally more related to the Right Hand Access or Left Hand Access area control/display arrangements or compartment functions then the area designator shall be "R" or "L". For such cases where the panels or side areas do not have an obvious functional relation to either the forward areas or side areas, then an arbitrary designator, one of the two or more options, shall be selected.

The second and third characters (000-0XX0) following the area or functional designator are panel or subdivision numbers. The panels or subdivisions within each area shall be numbered sequentially starting with the number "1" in a top left-to-right and top-to-bottom progression. The panels or subdivision numbers may be divisions of the Forward Control and Display Area and of the Right and Left Hand Access Areas (access doors to compartments or functional control and display panels), number of windows having items located on or adjacent to each window, and panels, access doors, items or equipment located on or attached to other designated areas. The panels or subdivision numbers of the functional designator shown in Figure 11 are discrete codes which merely designate the total number of similar functional equipment and their relative position within the control station. Coding of items located on these functional equipments is discussed in 3.3.3.

A subdivision of designated areas into rational subdivisions will be apparent for equipments located on or attached to most of the directional areas, e.g., Bulkhead Areas, Deck Area, and Window Areas, since the number designator is a discrete identifier of each equipment or item. Areas containing controls and displays, however, shall be subdivided (within each area) according to function(s) performed or according to designed subdivisions of the control and display panel.

The second character of the panel or subdivision code will not normally be required since a single number designator enables the coding of ten (0 through 9) subdivisions.

The fourth character (000-000X) of the control station panel or area code is a panel change code. This code shall be a letter designator (A through Z excluding "I"). Guidelines for applying this code when panel changes occur are specified in Table II, which illustrates the coding of changes to typical panels. These guidelines will preserve the sequential character of panel numbers even after numerous changes are made. Situations which may occur and are not covered in Table II are the relocation of a panel from nominally stowed positions to operationally installed positions. Such panels shall be designed per their installed location. Panels used in multicycle operational locations shall have unique identifiers in addition to their locations designation. The preferred designation is the primary operational location (the position in which the panel remains installed for the longest period of time). However, if deemed necessary for good crew operating practices, panels may be designated with multiple location codes.

3.3.3 Control Station Subcompartment Coding. The subcompartment discrete code shall be used to designate items located on the functional equipment identified and designated (by letter) in Figure 11. Such items shall be either a sequential number, starting with the number "1", or a letter (A through Z excluding "I"). The subcompartment code shall also be used to designate items within a locker or compartment located on or attached to the functional areas identified in Figure 11. Coding of these items shall be in accordance with 3.2.1.3.

PANEL CHANGE DESIGNATION METHOD

PANEL CHANGE	PREVIOUS PANEL DESIGNATION (PRIOR TO CHANGE)	NEW PANEL(S) DESIGNATOR
SINGLE PANEL SUBDIVIDED INTO TWO PANELS	F11	F11A, F11B
SINGLE PANEL REPLACED WITH A NEW PANEL OF EQUAL OR SMALLER AREA	F11	F11A
TWO PANELS REDESIGNATED AS SINGLE PANEL	F11, F12	F11A (F12 DELETED)
SEVERAL PANELS REDESIGNATED AS FEWER PANELS	F11, F12, F13	F11A, F12A (F13 DELETED)
PREVIOUSLY CHANGED PANEL SUBDIVIDED INTO TWO PANELS	F11A	F11B, F11C
TWO PREVIOUSLY CHANGED PANELS REDESIGNATED AS SINGLE PANEL	F11A, F12A	F11C
NEW PANEL INSERTED BETWEEN TWO PREVIOUSLY DESIGNATED PANELS	F11, F12	F11, F11A, F12
PREVIOUSLY DESIGNATED PANEL RELOCATED TO A NEW DIRECTIONAL AREA	F11 (F11 Deleted)	C3, C3A, C4 (Where F11 is relocated between two panels of new area); C3, C4, C5 (Where F11 is relocated adjacent to last designated panel in new area)

Applications of the Control Station Coding Convention including subcompartment coding are illustrated in Figures 12 through 14. Figure 12 is a coded planview of the forward area of a typical control station of a lunar landing type spacecraft in which directional orientation, e.g., forward, left, right, is defined with respect to the crewman's position when operating the primary controls and displays--namely, those located on the Forward Panels. For illustrative convenience, the functional areas of the planview, shown in the upper right-hand corner of Figure 12, have been separated. A coded planview of the other portions of the control station as viewed from the forward area and one aspect of the complete spacecraft are shown in Figure 13. Application of this coding convention to a large console type control station is illustrated in Figure 14.

3.4 EXTRA-VEHICULAR WORKSITE CODING. Location coding of extravehicular (EV) worksites shall be accomplished by application of either of the two coding conventions presented in 3.2 and 3.3 of this specification. Selection of either coding convention as more appropriate for coding a specific worksite shall be based on predominant configuration similarities between the EV worksite and a control station or a module room. When applying either of these conventions to EV worksites, the second character (0V0-0000) of the module/room or module/control station codes shall always be designated by the letter "V". The third character (0VX-0000) using the Module/Room Convention shall be a discrete letter designator (A through Z excluding "I"), and the third character using the Module/Control Station Convention shall be a discrete number designator (0 through 9). Otherwise, the guidelines for application of the coding convention to EV worksites shall be in accordance with those specified in 3.2 and 3.3.

4.0 OPERATIONS LOCATION CODING PLAN

A documented plan illustrating the applications of this Operations Location Coding Systems Specification shall be submitted by the contractor to NASA-Manned Spacecraft Center for review and approval on a date mutually acceptable to both the Government and the contractor, but in any event not later than 90 days subsequent to contract award. This plan shall include a description of the means by which the contractor will meet the requirements imposed by this specification and the procurement document including, but not limited to:

a. Identification of the spacecraft modules that are affected.

b. Identification of the functional name and locations within the spacecraft of all areas to be designated as "Rooms", "Control Station", and "Extra-vehicular Worksites".

c. Identification of the proposed coded designation of the above areas.

d. Identification of the proposed coding to be applied within each room, control station, or work station.

e. Identification of rooms, or portions thereof, requiring Room or Control Station placards or labels and preliminary placard configurations, illustrating room configurations as laid out for location coding. As a general guideline, placards shall be required for rooms in which there is a significant amount of preparation activity such as stowage of items, fitchecking of items or maintenance. Figure 15 contains typical examples of different placard types that may be required for various types of spacecraft rooms. These placards or labels shall be prepared in accordance with NASA General Specification SC-D-0001. Figure 16 is an example of a typical Room Placard. As noted in this figure, the Room Placard shall contain the module designation and the room designation at the top of the decal. The location code associated with lockers, compartments, etc., identified in Figure 16, shall be consistent with placards attached to these equipments and shall contain only their specific location codes within the room (XXXX). Control station type room placards shall contain the module designator and the control station number. Illustration of the directional areas and panel numbers within each area will not normally be required on these control stations. Placards or labels identifying the control station panels shall contain only the area designator and the panel identification codes (XXX). Module designators and control station number designators are not required on the panel placards.

f. Identification of all lockers, control/display panels, their location code designators and preliminary placard or label configurations. Placard markings and colors shall be in accordance with NASA General Specification SC-M-0003.

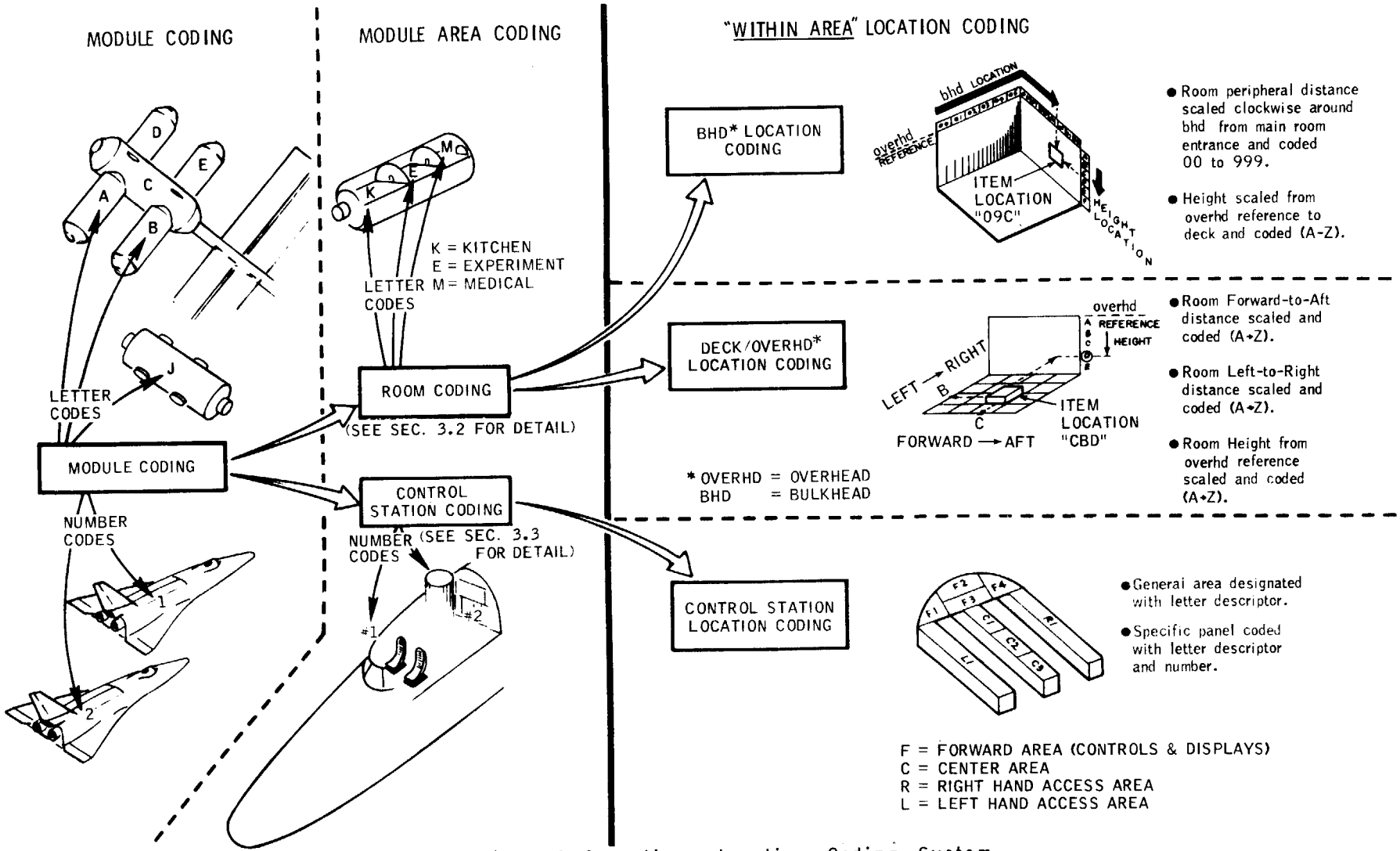


Figure 1. Overview of Operations Location Coding System

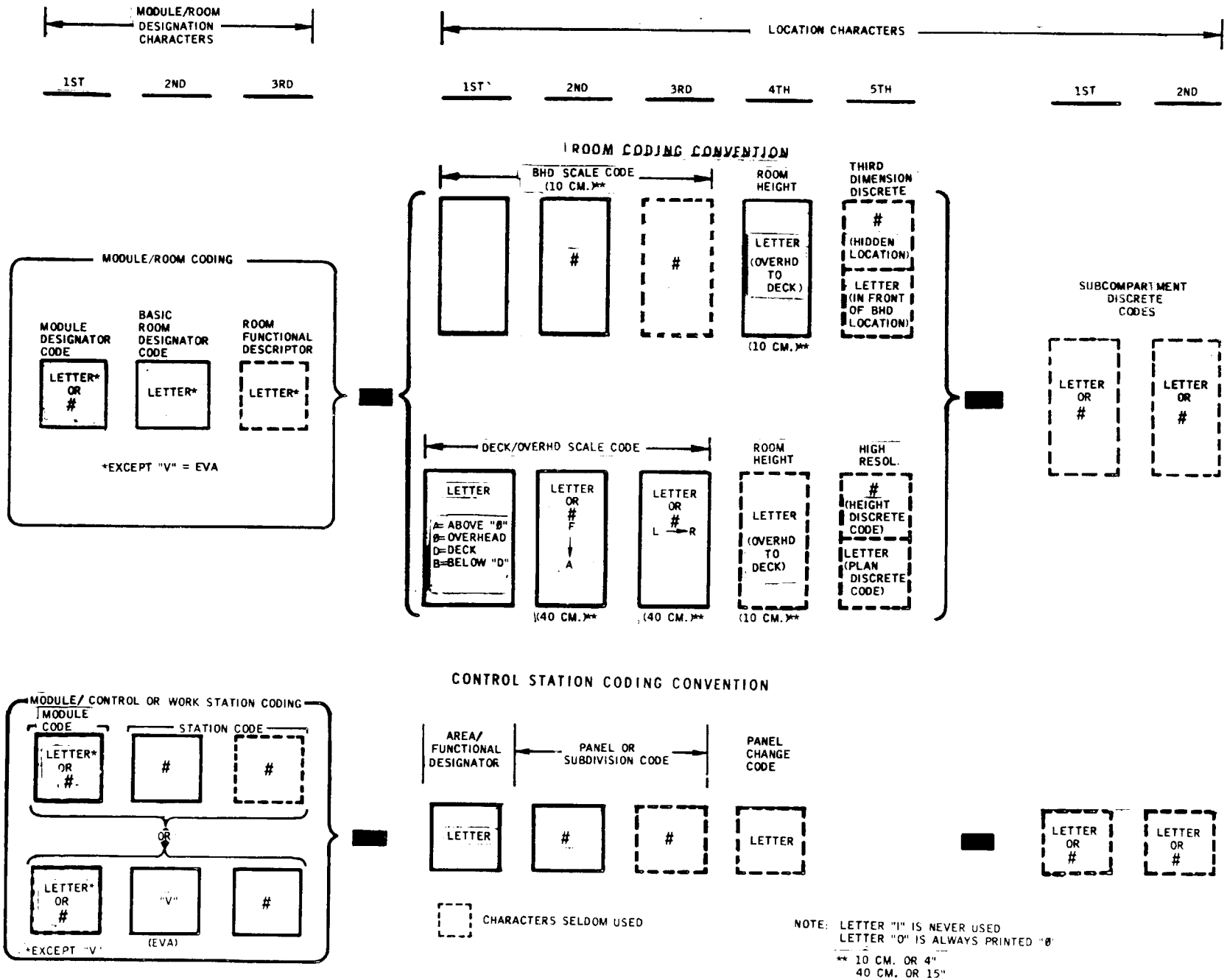
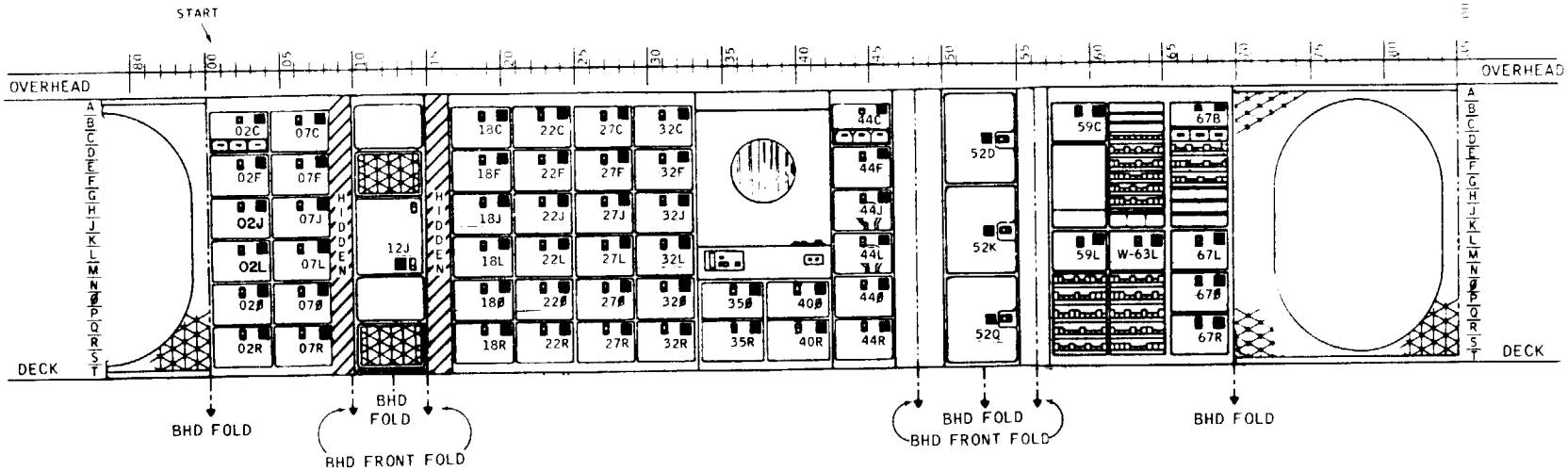
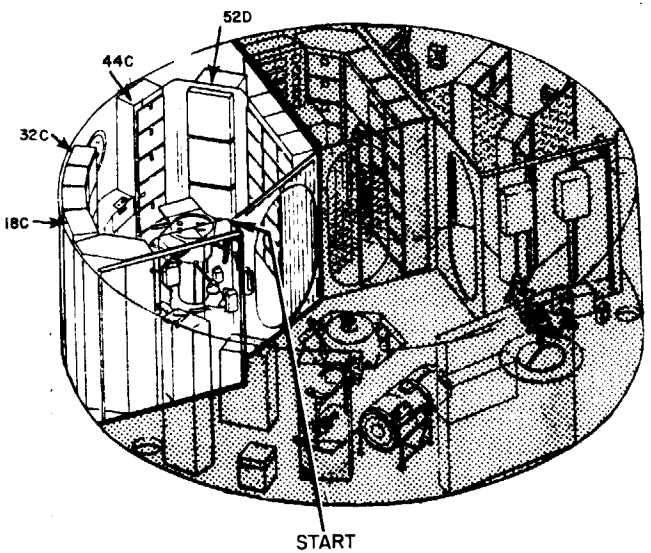


Figure 2. Operations Location Coding System





GUIDELINES FOR APPLICATION OF ROOM BULKHEAD CODING

1. LAYOUT SHALL START AT FIRST VERTICAL STATION AFTER MAIN DOOR-TO-ROOM, IF POSSIBLE.
2. ROOM PERIMETER SHALL BE UNFOLDED (EMPTY ROOM ELEVATION) AND LAID OUT AS ABOVE (CLOCKWISE WITH RESPECT TO THE STANDARD PERIPHERAL SCALE).
3. ROOM HEIGHT SHALL BE MEASURED FROM AN OVERHD REFERENCE PLANE TO DECK.
4. ITEMS LOCATED ON BULKHEAD SHALL BE CODED AT THEIR MIDPOINT WITH RESPECT TO BOTH PERIPHERAL DISTANCE AND HEIGHT. ITEMS SUCH AS LOCKERS AND CABINETS HAVING SIDE OPENING DOORS SHALL BE CODED AT THEIR POINT OF ACCESS. (A CABINET HAVING TWO OR MORE ACCESS PANELS/DOORS IS THUS PROVIDED WITH A UNIQUE LOCATION CODE FOR EACH ENTRANCE.)

Figure 3. Operations Location Coding System (Room Bulkhead Coding)

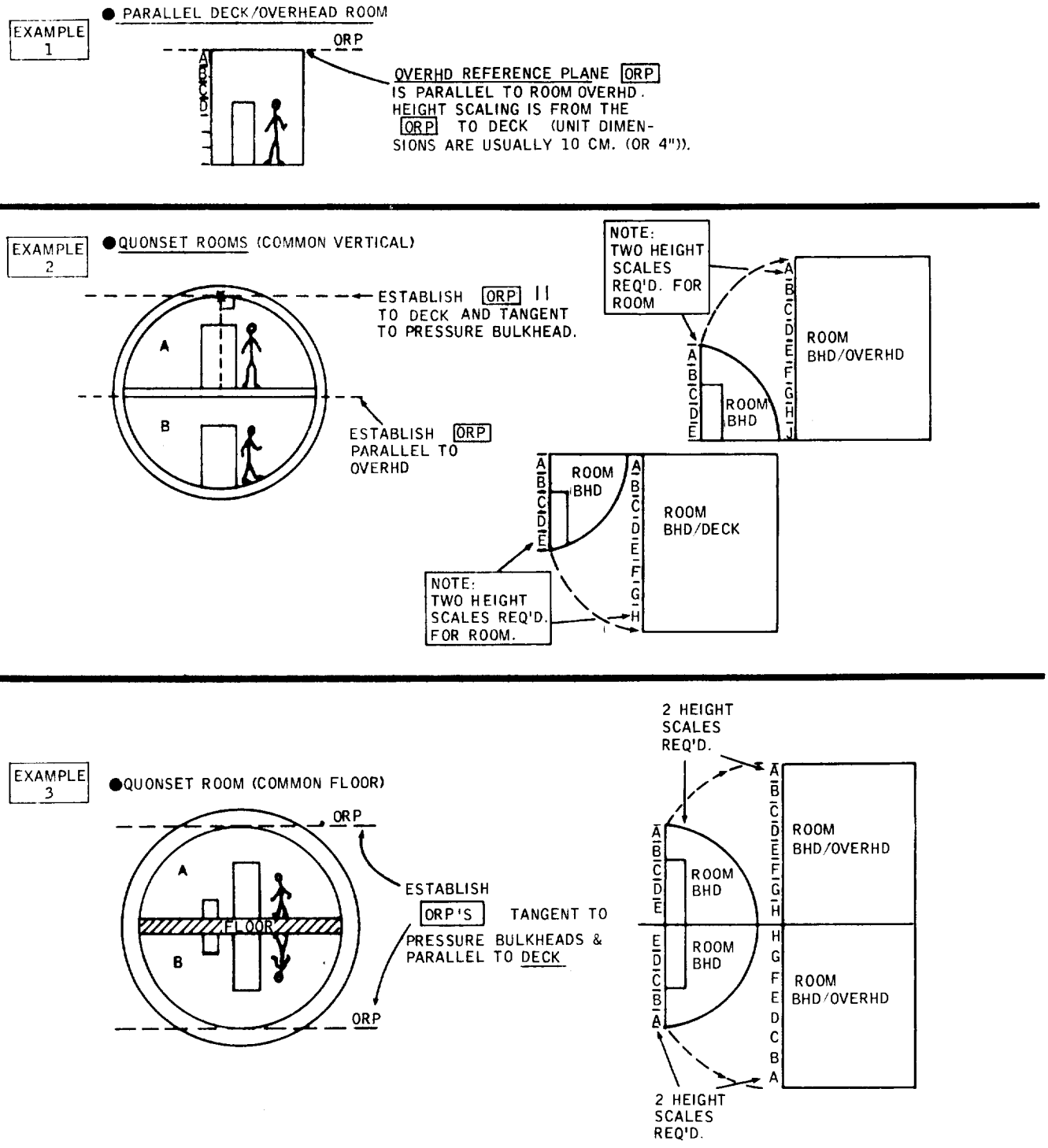
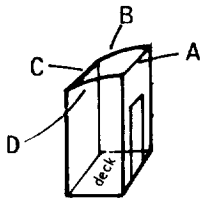


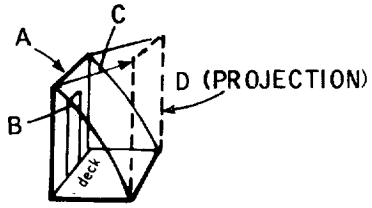
Figure 4. Height Location Coding

TYPE I

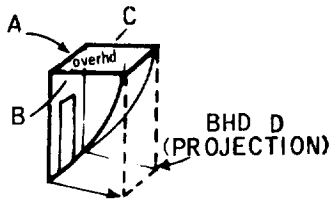


ALL FOUR BHD HEIGHTS
ARE CODED WITH PERPENDICULAR
BHD HEIGHT CODING METHOD.

TYPE II A

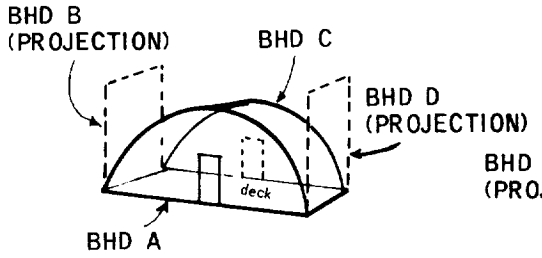


TYPE II B

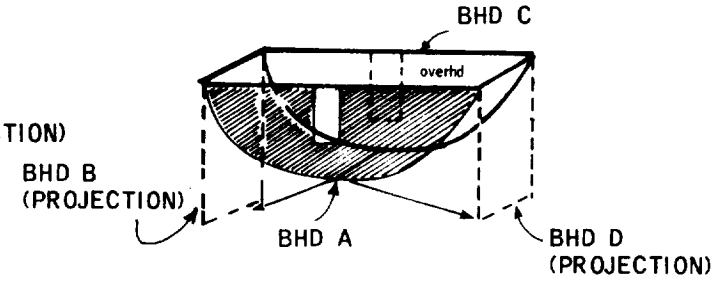


BHDs A, B, & C = PERPENDICULAR BHD HEIGHT CODING METHOD
BHD D = CURVED BHD HEIGHT CODING METHOD

TYPE III A



TYPE III B

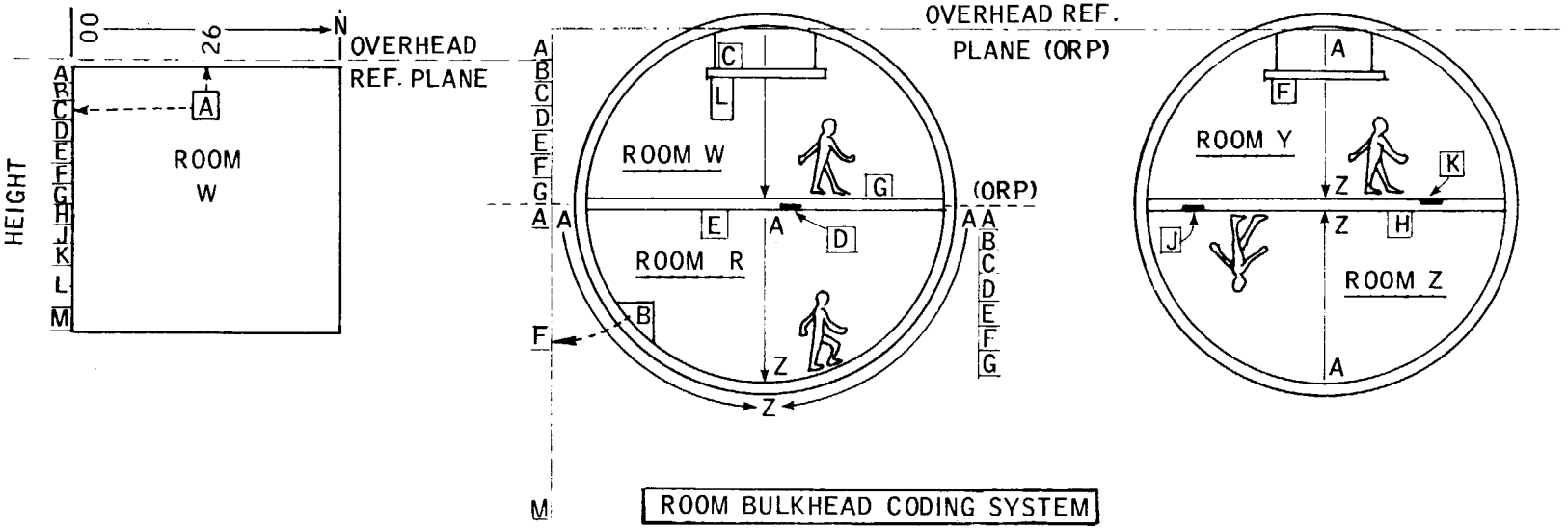


BHDs A & C = PERPENDICULAR BHD HEIGHT CODING METHOD

BHDs B & D = CURVED BHD HEIGHT CODING METHOD

Figure 5.

Quonset Room Types



ROOM BULKHEAD CODING SYSTEM

[A] EQUIPMENT LOCATED ON BHD IS CODED W - 26C*

[B] EQUIPMENT LOCATED ON QUONSET BHD IS CODED R - 26F

HEIGHT CODING IS SCALED FROM OVERHD REFERENCE PLANE, OR IN THE CASE OF A CURVED BHD, FROM THE TOP OF THE CURVED BHD FOLD OUT.

ROOM DECK/OVERHEAD CODING SYSTEM

[C] [D] EQUIPMENT LOCATED ABOVE OVERHD IS CODED W-AMN AND R-AMN

[E] [F] EQUIPMENT LOCATED ON OVERHD IS CODED R-OMN AND Y-OMN

[G] [H] EQUIPMENT LOCATED ON DECK IS CODED W-DMN AND Z-DMN

[J] [K] EQUIPMENT LOCATED BELOW DECK IS CODED Z-BMN AND Y-BMN

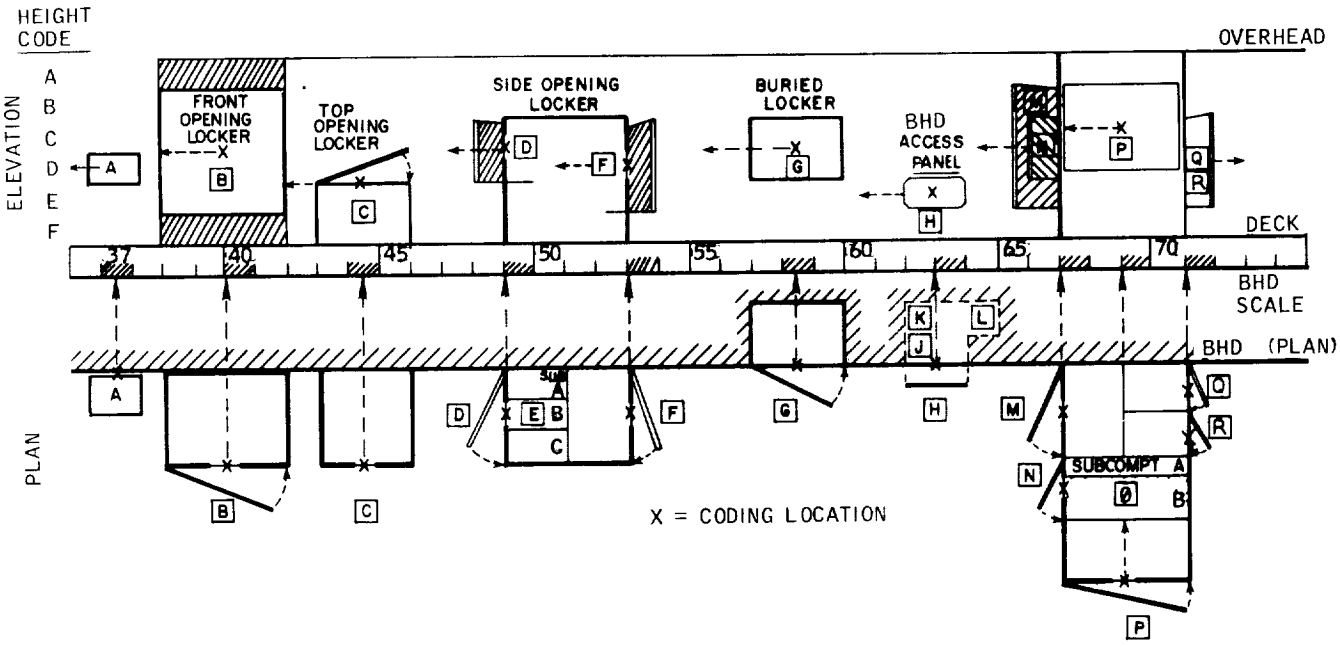
[L] EQUIPMENT LOCATED BELOW OVERHD IS CODED W-OMNC

C = HEIGHT CODE

RELATIVE HEIGHT LOCATION, E.G., ABOVE OVERHD, ON DECK IS NORMALLY SUFFICIENT TO LOCATE ITEMS ON DECK/OVERHD. SPECIAL CASES, [L], MAY REQUIRE USE OF AN ADDITIONAL CHARACTER TO ACCURATELY LOCATE ITEM ABOVE DECK OR BELOW OVERHD

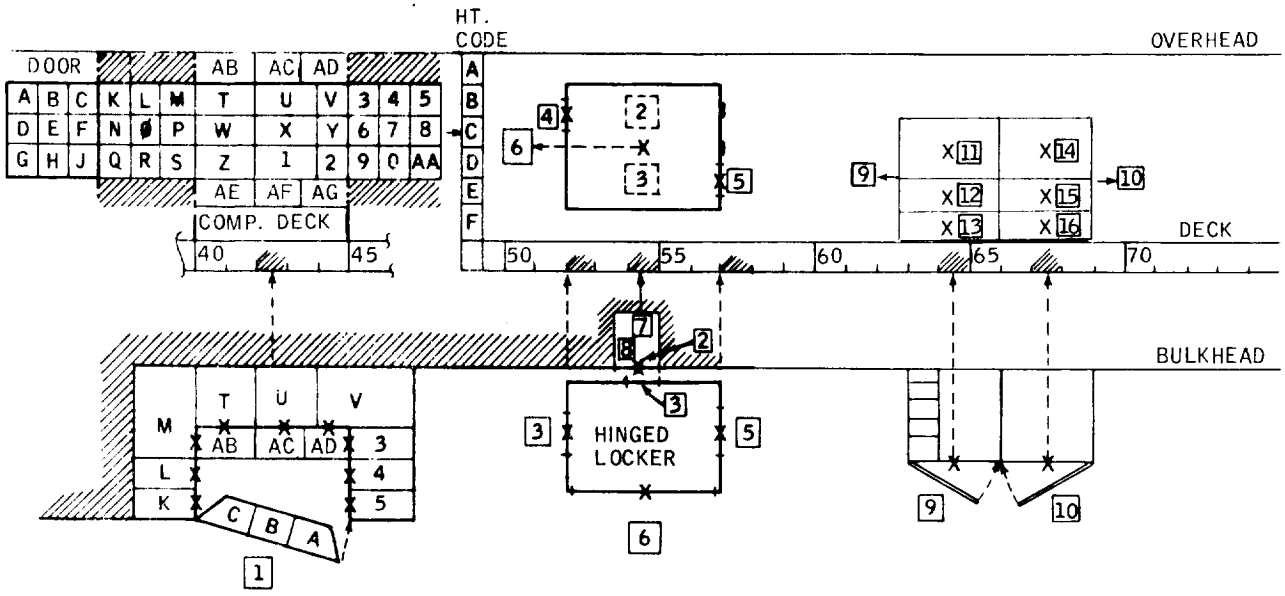
*ASSUMES ALL ROOM BHD LOCATIONS TO BE "-26" AND ALL DECK AND OVERHD LOCATIONS TO BE "MN"

Figure 6. Examples Of Height Location Coding



BULKHEAD CODING CONVENTIONS		CODING OF EXAMPLES (ROOM CODE IS "E") ROOM-(BHD) HT.-SUB
A	EQUIPMENT LOCATED ON BHD	E - 3 7 D
B	FRONT-OPENING LOCKER LOCATED ON BHD	E - 4 0 C
C	TOP-OPENING LOCKER LOCATED ON BHD	E - 4 4 D
D	SIDE-OPENING LOCKER LOCATED ON BHD	E - 4 9 C
E	SUBCOMPARTMENT OF LOCKER D (E-49C)	E - 4 9 C - B
F	SIDE-OPENING LOCKER LOCATED ON BHD	E - 5 3 D
G	BURIED LOCKER LOCATED ON BHD	E - 5 8 C
H	ACCESS PANEL OPENING ON BHD	E - 6 3 E
J	HIDDEN COMPONENT	E - 6 3 E 1
K	HIDDEN COMPONENT	E - 6 3 E 2
L	HIDDEN COMPONENT	E - 6 3 E 3
M	SIDE-OPENING LOCKER IN FRONT OF BHD (1ST LEVEL)	E - 6 7 C A
N	SIDE-OPENING LOCKER IN FRONT OF BHD LOCATION (3RD LEVEL)	E - 6 7 C C
Ø	SUBCOMPARTMENT IN LOCKER N (E-67CC)	E - 6 7 C C - B
P	FRONT-OPENING LOCKER IN FRONT OF BHD LOCATION (4TH LEVEL)	E - 6 9 C D
Q	SIDE-OPENING LOCKER IN FRONT OF BHD (1ST LEVEL)	E - 7 1 D A
R	SIDE-OPENING LOCKER IN FRONT OF BHD (2ND LEVEL)	E - 7 1 D B

Figure 7. Illustrative Examples of Bulkhead Location Coding



EXAMPLE

[1] LOCKER LOCATED ON BHD IS CODED _____ E - 4 2 C

SUBCOMPARTMENT CODING CONVENTION IS TOP LEFT → RIGHT, TOP → BOTTOM LETTERING DESIGNATIONS:

- DOOR SUBCOMPS. FIRST (E-42C - A,B,C,D,E,F,G,H, AND J)
- LEFT-HAND SUBCOMPS. SECOND (E-42C - K,L,M,N,Ø, P,Q,R AND S)
- CENTER SUBCOMPS. THIRD (E-42C - T,U,V,W,X,Y,Z,1 AND 2)
- RIGHT-HAND SUBCOMPS. FOURTH (E-42C - 3,4,5,6,7,8,9,0, AND AA)
- OVERHD (SUBCOMP.) FIFTH (E-42C - AB,AC,AD): DECK (SUBCOMP.) SIXTH (E-42C - AE,AF,AG)

[2] ACCESS PANEL - COVERED BHD LOCATION (1ST LEVEL) _____ E - 5 4 B A

[3] ACCESS PANEL ON BACK OF HINGED LOCKER IN FRONT OF BHD LOCATION (2ND LEVEL) _____ E - 5 4 D B

[4] ACCESS PANEL ON LEFT SIDE OF HINGED LOCKER IN FRONT OF BHD LOCATION (3RD LEVEL) _____ E - 5 2 B C

[5] ACCESS PANEL ON RIGHT SIDE OF HINGED LOCKER IN FRONT OF BHD LOCATION (3RD LEVEL) _____ E - 5 7 D C

[6] HINGED LOCKER IN FRONT OF BHD LOCATION (4TH LEVEL) _____ E - 5 4 C D

[7] COMPONENT HIDDEN BEHIND ACCESS PANEL (E-54BA) _____ E - 5 4 B 1

[8] COMPONENT HIDDEN BEHIND ACCESS PANEL (E-54BA) _____ E - 5 4 B 2

[9] FILM VAULT DOOR (LEFT) _____ E - 6 4 D

[10] FILM VAULT DOOR (RIGHT) _____ E - 6 7 D

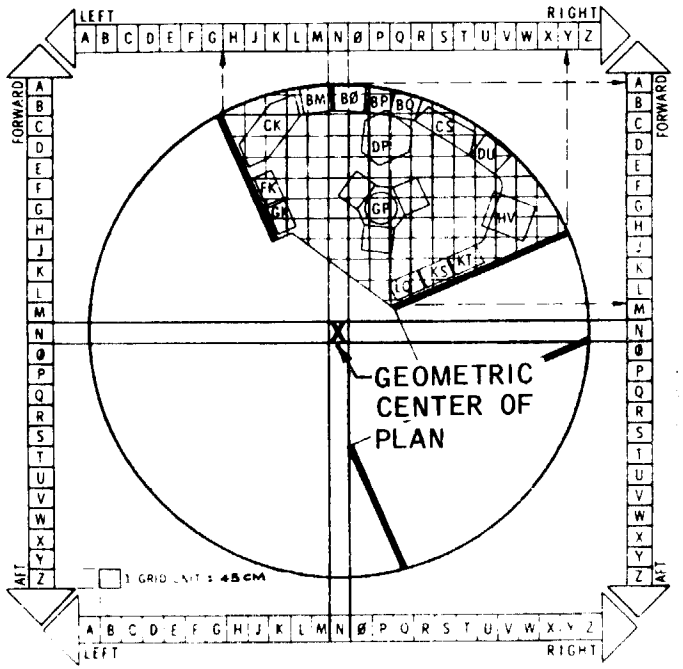
[11] FILM DRAWER (TOP) _____ E - 6 4 C

[12] FILM DRAWER ↓ _____ E - 6 4 E

[13] FILM DRAWER (BOTTOM) _____ E - 6 4 F

[14] [15] [16] FILM DRAWERS _____ E - 6 7 C, E, F

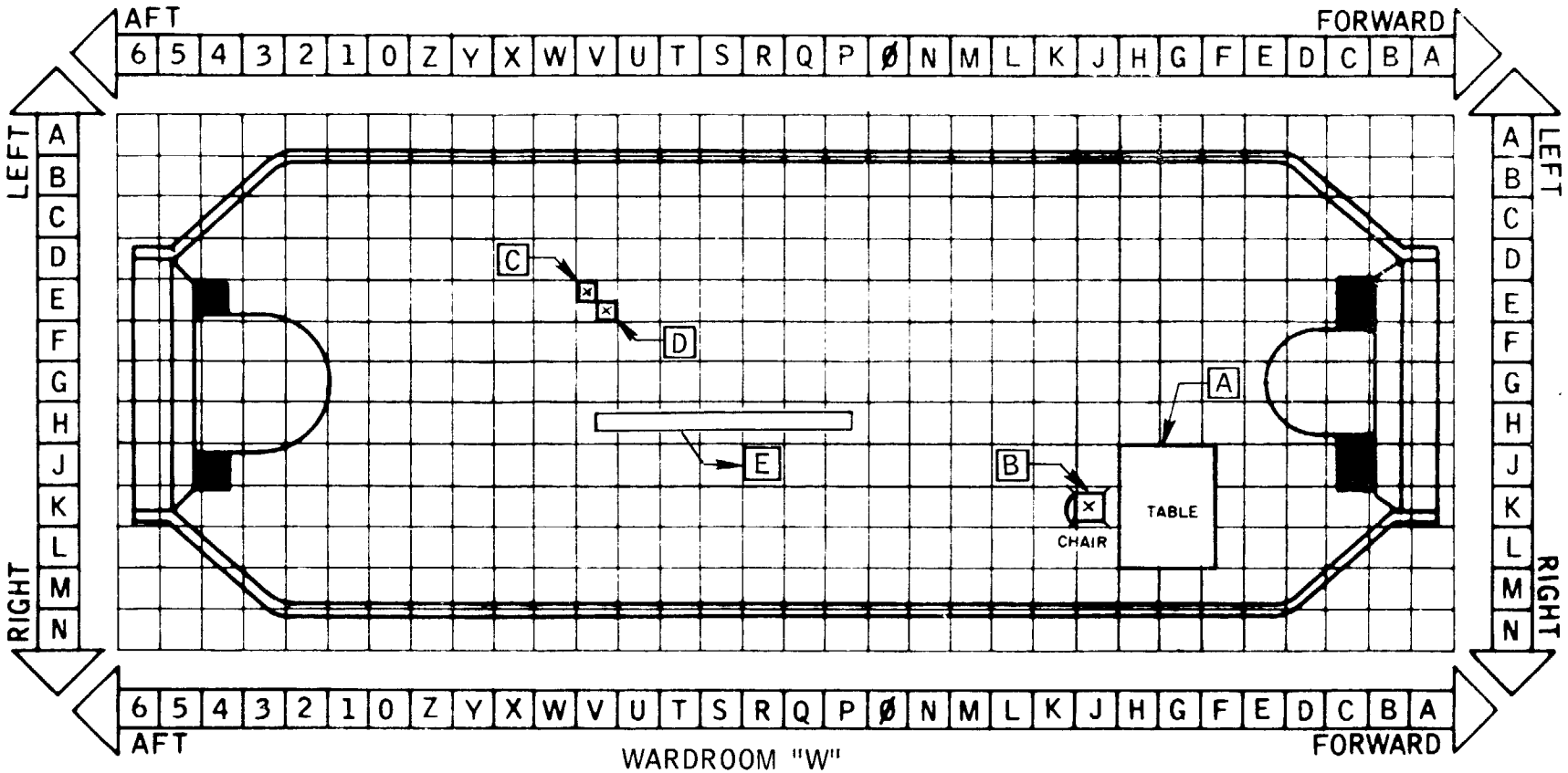
Figure 8
Illustrative Examples of Bulkhead Location Coding (Cont'd.)



GUIDELINES FOR APPLICATION OF DECK/OVERHEAD CODING

1. THE DECK/OVERHEAD PLAN SHALL BE LAID OUT AS FOLLOWS:
   - A. THE PLAN AXES SHALL BE PARALLEL WITH THE MODULE AXES.
   - B. THE GEOMETRIC CENTER OF THE PLAN SHALL BE LOCATED AT MIDPOINT OF FORWARD-TO-AFT AXES.
   - C. THE LEFT-TO-RIGHT SCALE SHALL START AT LEFT-FORWARD CORNER OF PLAN GRID.
2. THE OVERHEAD PLAN SHALL BE LAID OUT AS VIEWED FROM ABOVE AND PROJECTED ON THE PLANE OF THE DECK . (THIS ARRANGEMENT, AS OPPOSED TO ROTATING OVERHEAD PLANE ON DECK PLANE, MAINTAINS DIRECTIONAL CONSISTENCEY IN CODING WITH RESPECT TO DECK .)
3. ITEMS SHALL BE CODED AT THEIR PLAN "MIDPOINTS" AS RELATED TO THE PLAN GRID.
4. PLANS SHALL BE SCALED TO A UNIT DIMENSION OF 40 CM. (OR 15 INCHES) UP TO MAXIMUM SPACECRAFT DIAMETERS OF TEN METERS (OR 43.7 FEET). SPACECRAFT HAVING DIAMETERS GREATER THAN 10 METERS SHALL BE SCALED WITH THE MINIMUM MULTIPLE OF FIVE CM. (E.G. 45 CM.) TO PROVIDE MAXIMUM LOCATION RESOLUTION.

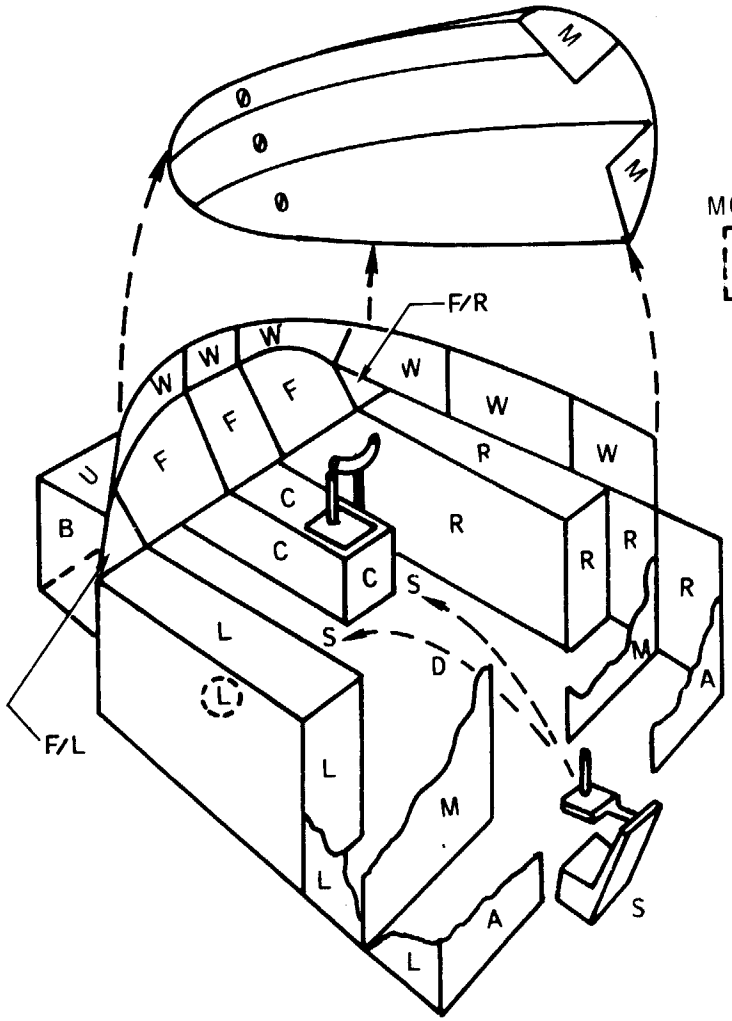
Figure 9. Deck/Overhead Coding

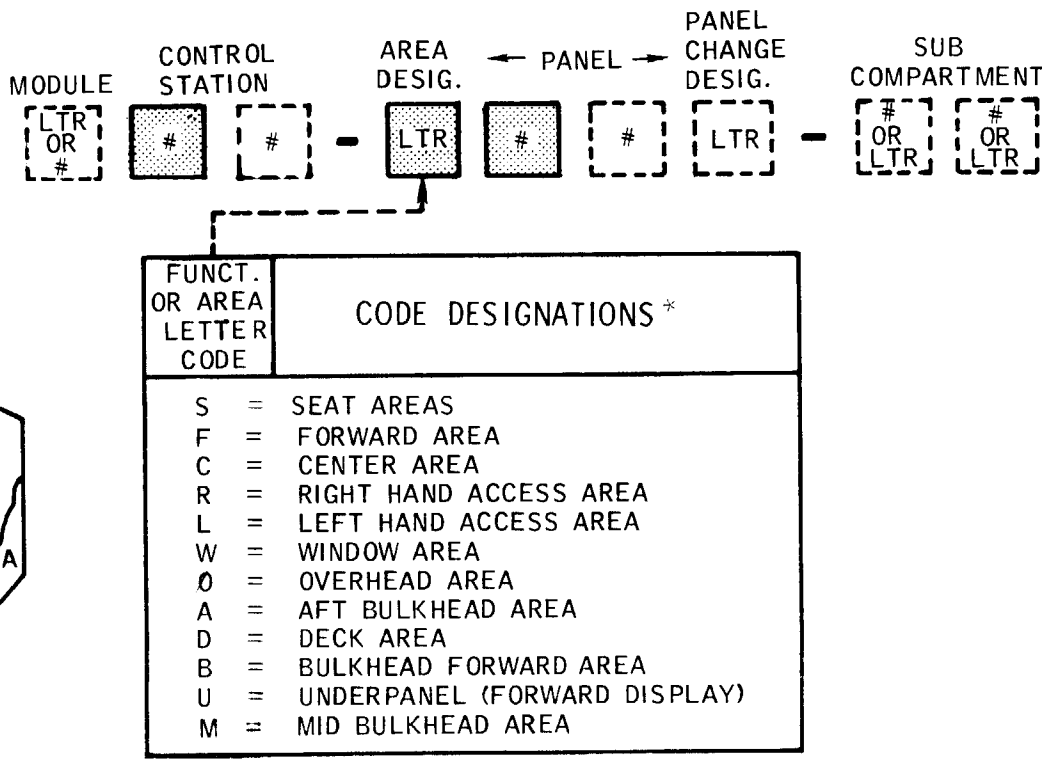


[A] TABLE LOCATED ON DECK IS CODED
[B] CHAIR LOCATED ON DECK IS CODED
[C] EQUIPMENT LOCATED ON DECK IS CODED
[D] EQUIPMENT LOCATED ON DECK IS CODED
[E] LIGHT FIXTURE LOCATED ON OVERHD IS CODED

W-DGK
W-DJK — HEIGHT
W-DVEHA
W-DVEHB — GRID RESOLUTION DISCRETE
W-OSH

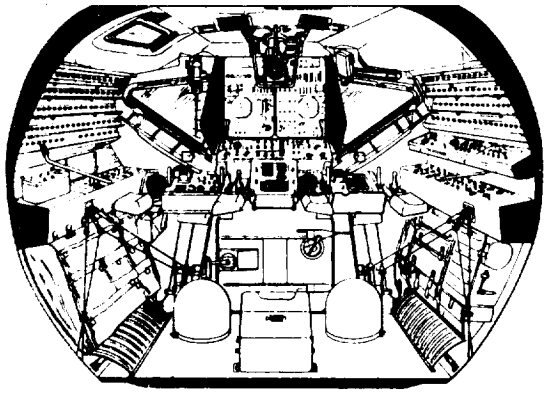
Figure 10. Examples of Deck/Overhead Location Coding

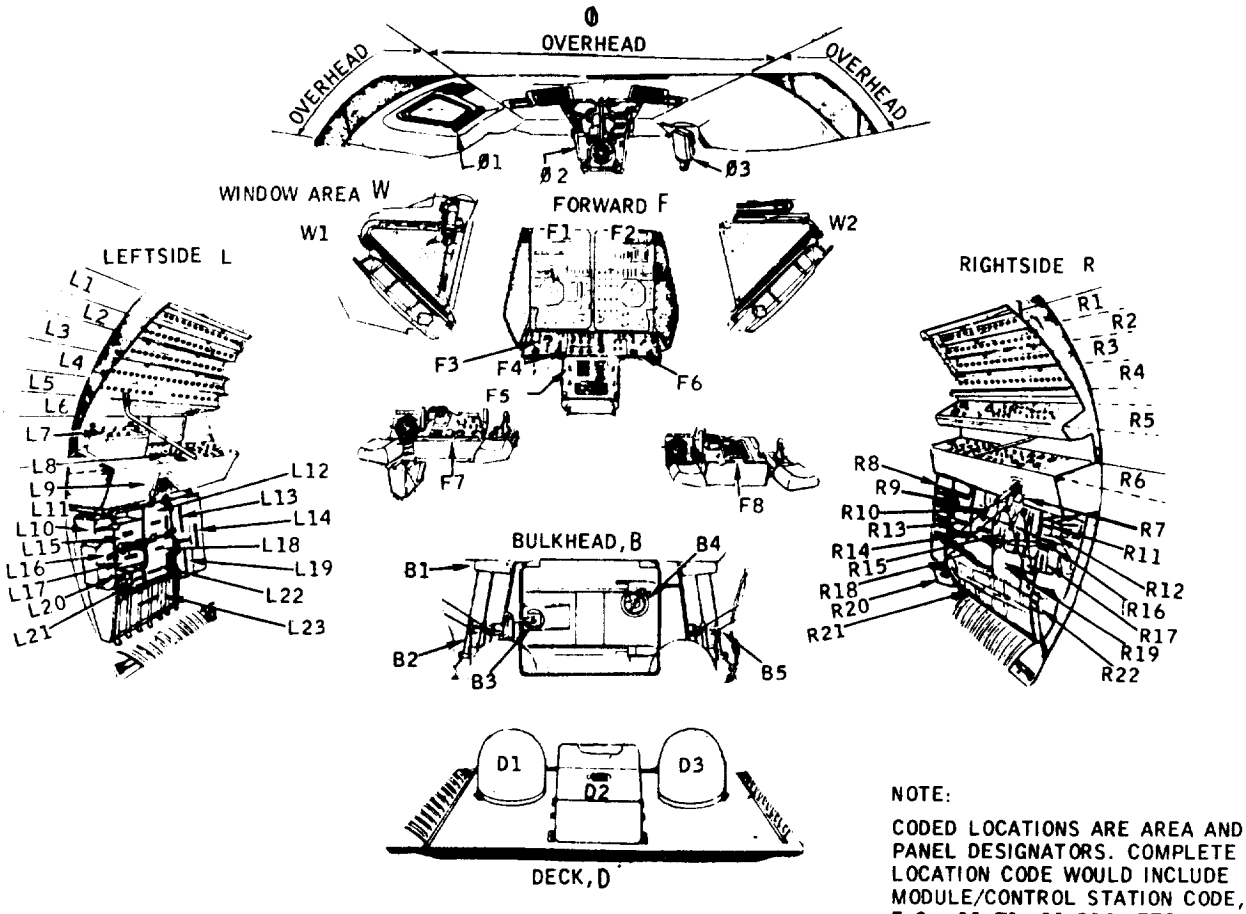




* THESE CODES HAVE DIRECTIONAL SIGNIFICANCE WITH RESPECT TO THE NORMAL "OPERATING" ORIENTATION OF THE CREW TO THE CONTROL STATION.

Figure 11. Control Station Coding Convention





NOTE:

CODED LOCATIONS ARE AREA AND PANEL DESIGNATORS. COMPLETE LOCATION CODE WOULD INCLUDE MODULE/CONTROL STATION CODE, E.G., 11-F1, 11-R12, ETC.

Figure 12.

Lunar Landing Type Vehicle Control Station

(Forward Section)

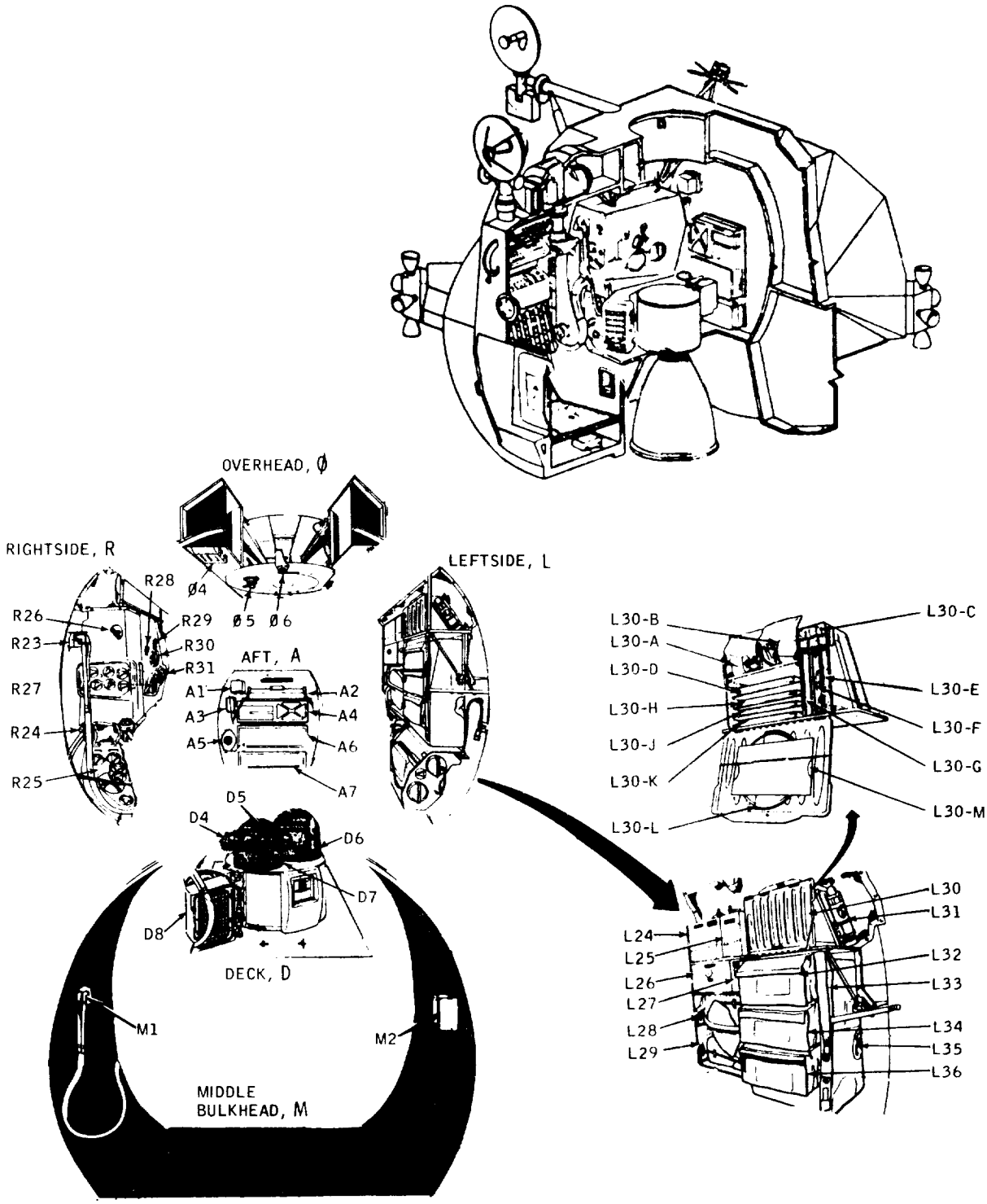
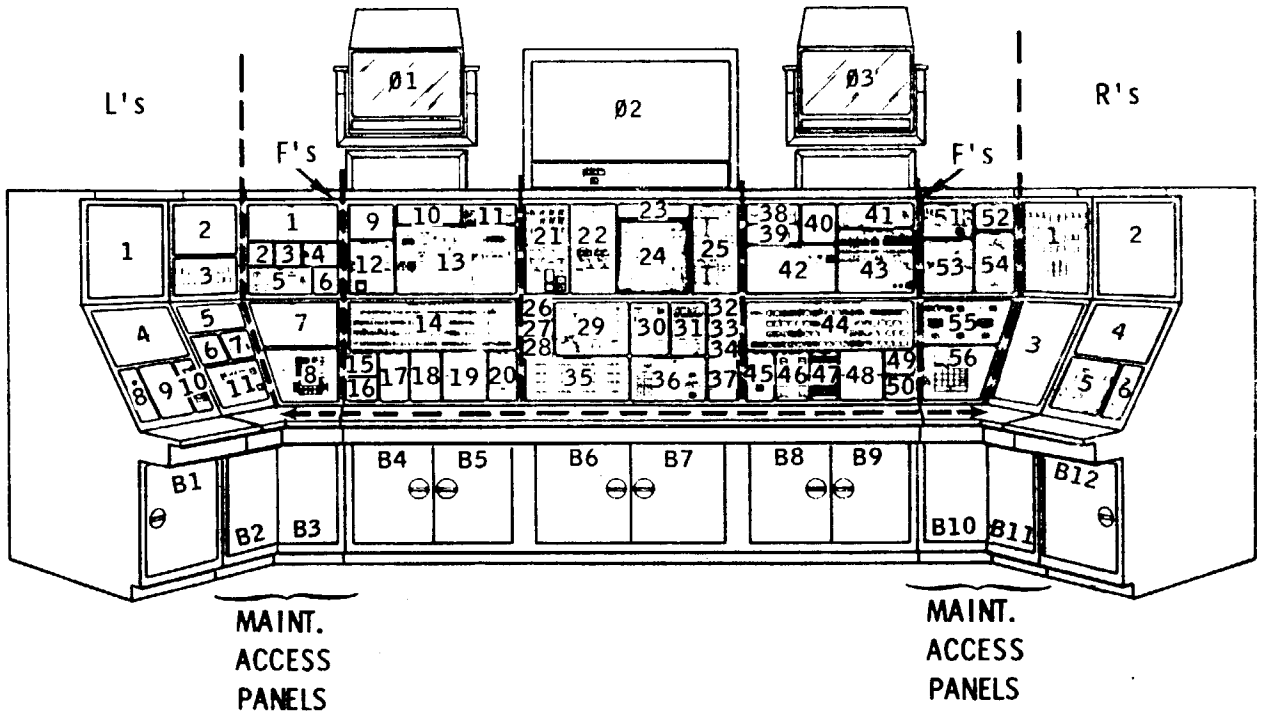


Figure 13.

Lunar Landing Type Vehicle Control Station

(Aft Section)



F = FORWARD CONSOLE PANELS

L = LEFT CONSOLE PANELS

R = RIGHT CONSOLE PANELS

B = BULKHEAD (STOWAGE AREAS)

Ø = OVERHEAD DISPLAYS

- SEQUENTIAL CODING WITH AREAS (L, F, R, B & Ø) TOP L→R, TOP →BOTTOM
- T →B, L →R MAY BE MORE APPROPRIATE IN SOME CASES; e.g., F15,16 : F26,27,28 : F32,33,34

Figure 14. Major Console (Control Station) Coding Example (Room # -)

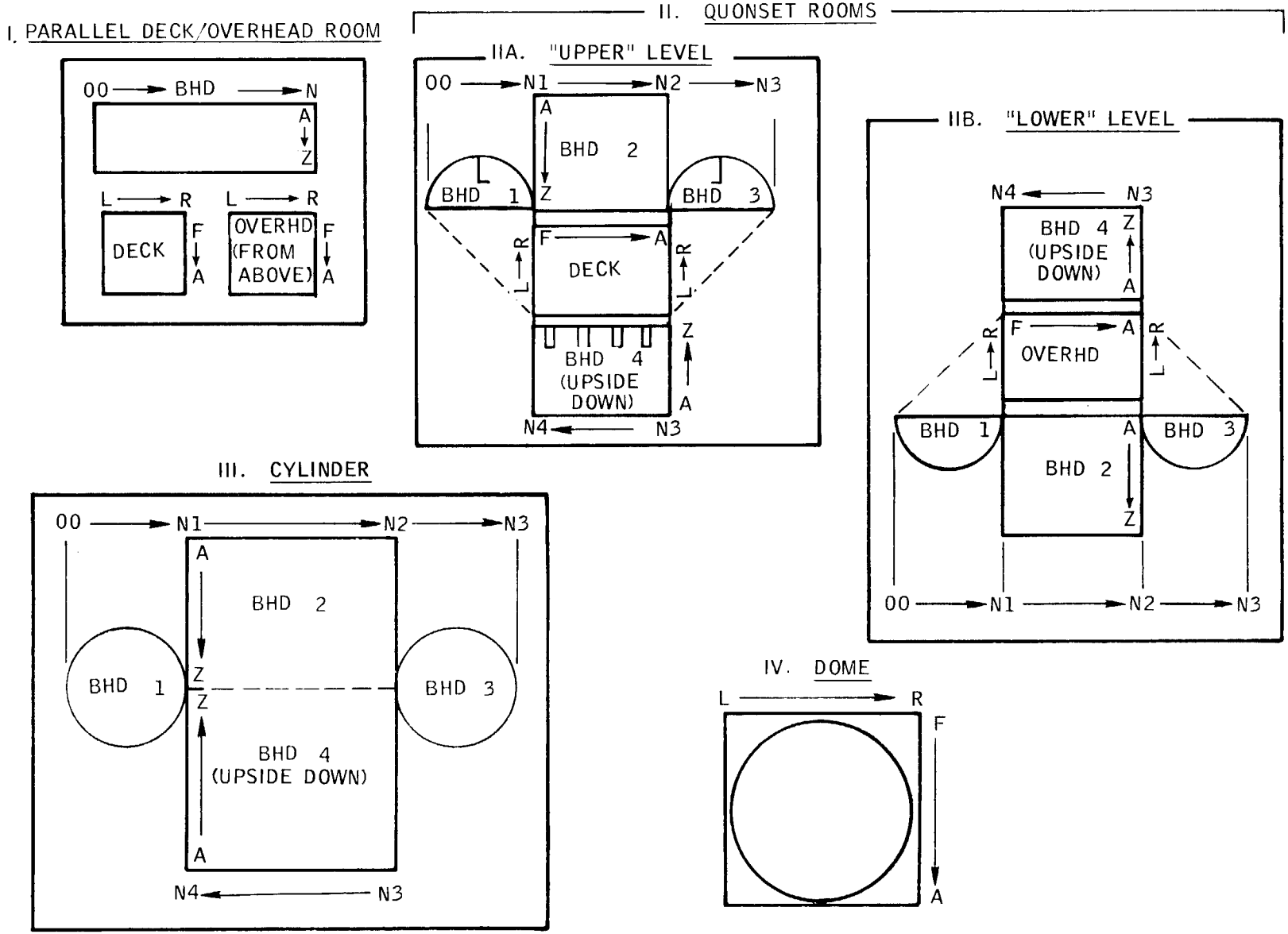


Figure 15. Room Decal Types

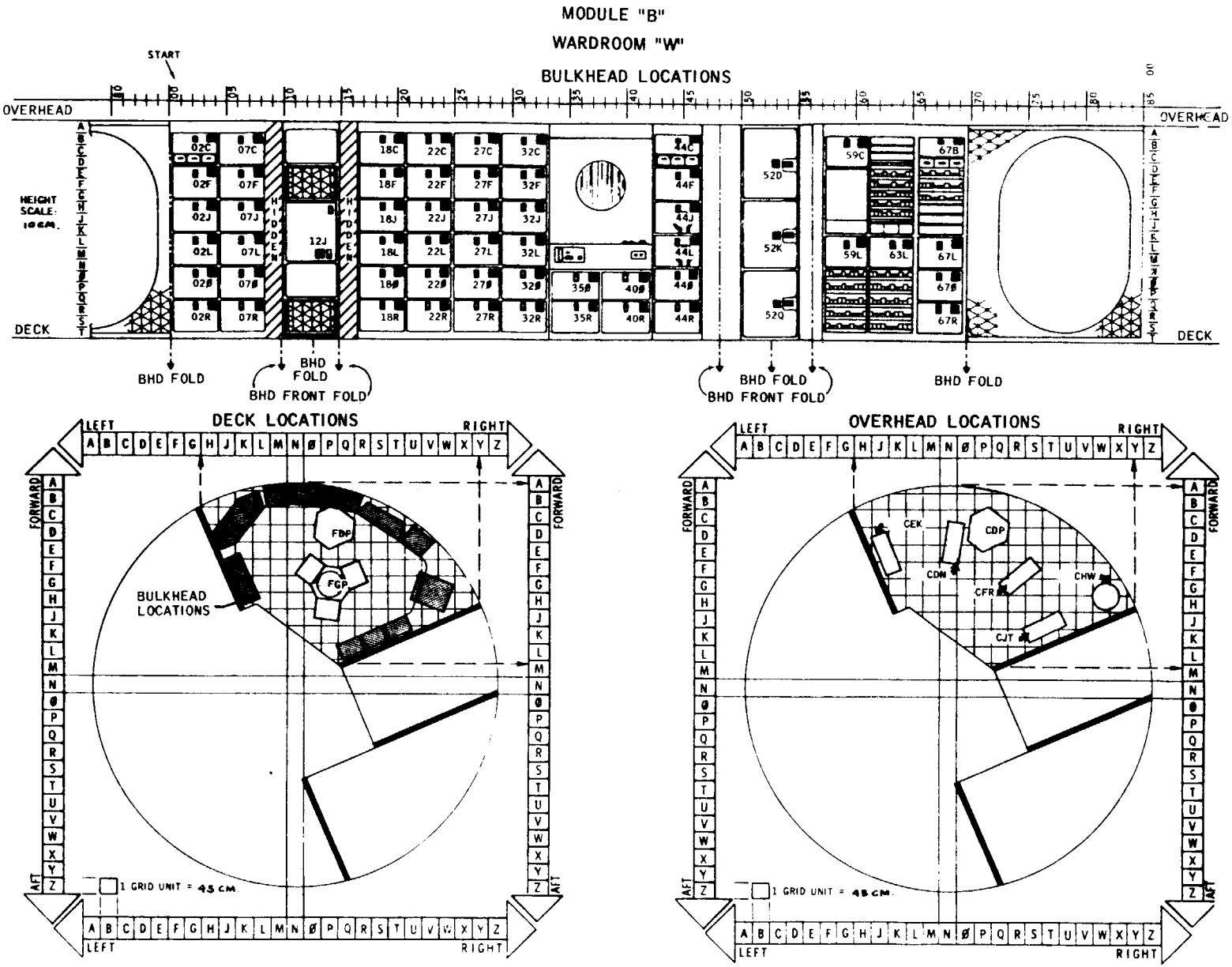


Figure 16. Typical Room Decal

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